EDITORIAL

Journal of Physics: Celebrating 50 years of serving physics

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Editorial

Journal of Physics: Celebrating 50 years of serving physics

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Professor Sir John Enderby's primary research interest has been in the structure and properties of liquid metals and semiconductors, ionic fluids, glasses and amorphous solids and he has published over 180 papers in this field. Sir John was elected a Fellow of the Royal Society in 1985 and became its Physical Secretary and Vice President in 1999. He is a past President of the Institute of Physics and also served as Editor-in-Chief of Journal of Physics: Condensed Matter.

Sir John was elected to the Academia Europaea in 1989 and was made a Commander of the Order of the British Empire in 1997. He was awarded the Guthrie Medal and Prize of the Institute of Physics and is a Foreign Member of the Royal Holland Academy of Science and Humanities. He was knighted for services to Science and Technology in 2004 and was appointed an Honorary Fellow of The Institute of Physics, the highest honour given by IOP.

I feel very privileged to have received an invitation to give my personal thoughts on the 50th anniversary of the Journal of Physics (J. Phys.) series. I have been involved with the Institute of Physics (IOP), the Institute of Physics Publishing (IOPP) and the original Physical Society for over 55 years. My first paper was submitted to the Proceedings of the Physical Society (Proc. Phys Soc.) in 1959 [1] and took all of 18 months before it actually appeared! I have served the IOP in several capacities and was honoured to be elected President in 2006.

I have always been deeply concerned with publishing and have greatly enjoyed working with the staff of IOPP as a referee, an Editor and more recently in a scientific advisory role. To me, the great strength of the IOPP is that as part of IOP it is able, through money raised by its publishing presence, to make possible a wide range of activities organised by IOP, the aim of which is to serve the physics community, both here and abroad. Long may the synergy between IOP and IOPP continue.

It is of course impossible for me to do justice to the considerable legacy of J. Phys. in this short editorial. Before discussing the origins and history of the series I take this opportunity to highlight two specific celebratory initiatives, respectively looking to the past and into the future, specially compiled by the journal teams and Editorial Boards. Featuring contributions from leading scientists who will be familiar to readers across physics, the collections are as follows:

The Emerging Leaders/Talents collection
A series of special article collections co-ordinated across the J. Phys. series featuring invited research papers from early career researchers identified by the Editorial Boards as ‘rising stars’ in their fields.

The Viewpoints collection celebrating 50 of the most influential articles in J. Phys.
Collection of 50 of the most influential articles published across the J. Phys. series, accompanied by commentary pieces, written by the authors of the original articles and other experts in the field. Free to read throughout 2017, both collections can be reached through the anniversary landing page at ioppublishing.org/jphys50

How it all began (adapted from [2])

The Physical Society arose from the initiative of Professor Frederick Guthrie, Professor of Physics at the Royal College of Science, South Kensington. Together with his assistant, William Barrett (later Sir W Barrett, FRS), he proposed setting up a ‘Society for physical research’, by sending an initial circular to 30 physicists in 1873. Emphasis was to be on practical and experimental science. The Committee of the Council on Education offered the Society the free use of laboratories and apparatus in South Kensington and, at a meeting on 14 February 1874, the Physical Society of London was formed with 29 people present.

The Institute of Physics held its inaugural meeting on 27 April 1921. In 1917 the Council of the Physical Society had started to explore with the Faraday Society, the Optical Society and the Roentgen Society ways of improving the professional status of physicists. The Institute was incorporated by special licence from the Board of Trade in November 1920 with the Royal Microscopical Society and the Roentgen Society associated as participating societies. Sir Richard Glazebrook was the first President of the Institute and in 1920 Sir Joseph Thompson was elected as its first Honorary Fellow.
The newly-formed Institute needed a publication, and in October 1923 the first regular issue of the Journal of Scientific Instruments appeared. (This was an early example of the IOP responding to the needs of the community, but more of this later). The Society produced Reports on Progress in Physics, an annual publication which first appeared in 1934.

The Society and Institute shared administrative arrangements. The first secretary to the Board was F S Spiers who worked from the offices of the Faraday Society until his sudden death in 1926. The following year, the Institute acquired, rent-free, 1, Lowther Gardens from the Royal Commission that had organised the Great Exhibition. A registrar was appointed and a members’ library opened. After the war, the Institute returned to London after its sojourn in Reading, first to 19 Albemarle Street, where it stayed for little over a year, before moving to 47 Belgrave Square in December 1946.

Initial talks about merging the two organisations started in 1946 and 1947 but nothing came of them. Proposals for the Society and Institute to start a new journal in applied physics failed because post-war paper rationing made the proposition impractical.

In 1949 Proceedings was split into two sections, section A—atomic and sub-atomic physics and section B—macroscopic physics. This split was intended to speed the time between paper submission and publication. Expansion in publishing activity occurred in 1950 when the Physics in Industry section of Journal of Scientific Instruments became the British Journal of Applied Physics. A monthly Bulletin was also started.

By 1960 the Faraday Society, the Royal Meteorological Society and the British Institute of Radiology had withdrawn from the Institute. Sir Neville Mott, the Society’s President, re-opened the debate about merger between the Institute and the Society in 1957; this eventually took place in 1960 followed by the acquisition of a Royal Charter in 1970 when the title ‘Institute of Physics’ was adopted. Sir John Cockcroft was the first President of the combined Society and Institute. Premises in Lowther Gardens became the editorial offices and Belgrave Square became the Institute’s headquarters. At the time of the merger there were just over 9000 members.

The role of the publishing section was entrusted to a new organisation—the Institute of Physics Publishing Ltd (IOPP)—the main headquarters of which moved to Bristol in 1975. Following considerable expansion, today the international IOPP operation extends to overseas offices in Beijing, Moscow, Philadelphia, St Petersburg, Tokyo and Washington DC, with a publishing portfolio (at the time of writing) amounting to 78 journals (including partner titles), 22 publishing partnerships, 9 magazines and community websites and, most recently, the launch of a new e-book programme. Through this activity IOPP gift aids its profits to IOP for the specific purpose of encouraging and furthering the role of physics in education, in improving the quality of life both in the UK and elsewhere, and in creating the tools and environment for economic growth and success.

What happened to the various publications existing after the merger?

The J. Phys. series grew out of the Proceedings of the Physical Society and now consists of:

- Journal of Physics A: Mathematical and Theoretical
- Journal of Physics B: Atomic, Molecular and Optical Physics,
- Journal of Physics: Condensed Matter
- Journal of Physics G: Nuclear and Particle Physics
- Journal of Physics: Conference Series

But what happened to ‘E’ and ‘F’?

The Journal of Scientific Instruments became part of the J. Phys. series, designated ‘E’ until 1990 when it became Measurement Science and Technology. Again, this change reflected the needs of the community. The original journal was very much based on small-scale laboratory based equipment, but with the growth of large facilities funded by the private and public sector, many of our members felt that there should be more emphasis on technology. Likewise, the British Journal of Applied Physics became J. Phys. D. The current Journal of Physics Condensed Matter (JPCM) arose in 1989 from the amalgamation of Journal of Physics C: Solid State Physics (J. Phys. C) and Journal of Physics F: Metal
Physics (J. Phys. F), with the latter geared to liquid and solid metals. Influential physicists at the time such as John Ziman, Norman March and Norman Cusack felt that the UK was leading the field of liquid metals and did not think that J. Phys. C met their needs. However, many authors disliked J. Phys. F and mockingly called it the ‘Journal of the Breaking of Iron Bars’. They objected that a fundamental study of the metallic state at the microscopic level (for example ferromagnetism) did not fit very comfortably with macroscopic investigations of the mechanical properties of metallic alloys. Responding to these concerns ‘C’ and ‘F’ were combined and JPCM became a flagship journal of IOPP and is now established as an authoritative publication covering all branches of condensed matter including the liquid and amorphous states and surface physics.

Physics World (arguably the best physics magazine on the planet) replaced the original monthly Bulletin and Reports on Progress in Physics, dating back to 1934, is today regarded as one of the leading review journals in physics boasting numerous Nobel Prize winners as authors who have accepted invitations from the Editorial Board to write over the years.

The Editorial Boards

Each journal has a carefully chosen Editorial Board led by a distinguished Editor—in—Chief. Unlike many comparable boards, IOPP’s philosophy is that members, as outstanding scientists in their own right, should be involved directly with strategic issues. Board members do not just act as adjudicators for difficult papers (although this is essential and very worthwhile activity) or simply receive financial statements provided by IOPP staff. They are specifically asked for advice on emerging topics, editorial strategy and issues relating to journal delivery, format and functionality. For example, the board of J. Phys. D recommended that papers should be grouped according to the sub discipline and this idea was put into practice in 1991. The Editorial Board of JPCM proposed that there should be a new section devoted to surface physics and further, each specialist section should have its own Editorial Board, reporting to the overall board. In short, IOPP is keenly aware that it needs to keep in close contact with the communities it serves in order to ensure that its publishing programme and services remain relevant to the evolving needs of researchers; the Editorial Boards represent a very powerful way of achieving just that.

The scientific legacy of the Proceedings of the Physical Society

As we have seen, the origins of the present J. Phys. series can be traced back to Proc. Phys. Soc. A glance at the archived contents of this journal illustrates its huge influence on the development of physics. Take for example the condensed matter phenomenon of the ‘Metal to Non Metal Transition’. This remains a most active area and is associated directly and indirectly with such diverse topics as high temperature superconductors, the limits of silicon technology and its application to solar cells and wave propagation in the presence of random scattering centres. Interestingly this topic began here in Bristol, now the home of IOPP, at a conference held in 1937. It was pointed out by de Boer and Verwey that nickel oxide, a transparent non-metal should, according to the accepted model developed by Wilson, be metallic in character because the eight electrons of Ni$^{3+}$ ion would only partly fill one of the $d$-bands. This observation was published in Proc. Phys. Soc. [3] followed by papers by Mott, Hubbard, Ziman and many others. Mott himself (Nobel Laureate 1977) wrote extensively about the transition inspired by the deBoer/Verwey observation. His book, Metal—Insulator Transitions (Taylor & Francis Ltd) published in 1990 remains a valuable source of ideas and references to this important branch of condensed matter physics.

Proc. Phys. Soc. was a broad based journal and contained several seminal papers. For example, Fred Hoyle wrote an early paper on the creation of heavy elements in stars. At the other end of the length scale, Van’t Hoff wrote about his work on osmotic pressure. There are papers by Lord Rayleigh, Chadwick, J J Thomson and many other Nobel Laureates.

One paper, the full significance of which has only recently been recognised, was authored by Ehrenberg and Siday [4] entitled ‘The Refractive Index in Electron Optics and the Principle of Dynamics’. This paper anticipates the Aharonov and Bohm effect, which is closely related to the Berry Phase a crucial concept in many areas of physics. Let me
reproduce part of Sir Michael Berry’s letter that appeared in the August 2010 issue of *Physics Today* [5].

Berry begins his letter as follows:

‘Writing about what is usually termed the Aharonov–Bohm (AB) effect, Peter Sturrock and Timothy Groves argue (*Physics Today*, April 2010, page 8) that the same physics was discovered a decade earlier and should rightly be called the Ehrenberg–Siday effect. I agree that Werner Ehrenberg and Raymond Siday deserve recognition for their anticipation of AB. Indeed, in recent talks celebrating the 50th anniversary of AB, I began by describing the unfairly neglected paper (my italics) by Ehrenberg and Siday. Nevertheless, I have come to a different conclusion from Sturrock and Groves: The expression ‘Aharonov–Bohm effect’ is justified’.

Berry continues ‘Attribution of credit is a delicate matter. It tends to excite strong feelings, and I write about it reluctantly. But the Ehrenberg–Siday paper does seem to exemplify the unfortunate phenomenon identified by Alfred North Whitehead in a 1916 address to the British Association for the Advancement of Science: “Everything of importance has been said before, by someone who did not discover it”.

There is a lesson here for administrators obsessed with immediate ‘impact’.

**The Journal of Physics series today**

Given the legacy of *Proc Phys Soc.*, it comes as no surprise that the *J. Phys.* series today is now established as one of the most recognisable and authoritative journal series’ in physics.

Over the last half a century more than 40 Nobel Prize winners have published with *J. Phys.* titles and to date the series has published nearly 150,000 articles (amounting now to more than 3000 articles per year). In a reflection of its enduring relevance across physics, in 2016 alone content in the series was downloaded more than 4.1 million times across over 200 countries, and cited over 110,000 times—this means that someone, somewhere in the world is downloading a *J. Phys.* article every 7.5 s!

The geographical distribution of full-text downloads since 1996 (when the *J. Phys.* series was first made available online) is shown in figure 1 in contrast to the authorship shown in figure 2.

Although it can only be a superficial take, a look at the frequency of article keywords terms across the series in 2016 provides an interesting picture of what is going on today across the landscape of mathematical physics, atomic and molecular physics, condensed matter, applied physics, and nuclear and particle physics. I doubt very much that the likes of ‘graphene’, ‘quantum information’ or ‘topological insultators’ would have featured so prominently (or even at all) a few years ago.

What struck me in preparing this celebratory editorial was how rapidly the staff and Editors have moved to capture new physics. Take, for example *J. Phys.* B. In the period after WW2 atomic physics was dominated by two towering figures, Sir Harrie Massey and Sir David Bates. Between them, completely new schools were created with a focus on atomic collisions. Naturally, the early issues of *J. Phys.* B reflected this field. However, the atomic and molecular physics changed dramatically in the mid 90s with the discovery of Bose Einstein Condensates (BEC).

In 1995 the first gaseous condensate was produced by Eric Cornell and Carl Wieman at the University of Colorado at Boulder NIST–JILA laboratory, in a gas of rubidium atoms cooled to 170 nK. Shortly after, Wolfgang Ketterle at MIT demonstrated important BEC properties. For their achievements Cornell, Wieman, and Ketterle received the 2001 Nobel Prize in Physics. Subsequently many isotopes were condensed, followed by molecules, quasi-particles and photons.

It is to the great credit of the Editors that this discovery merited the attention of the journal, even though at that time there was little UK participation in this area (a situation that soon changed). Accordingly, *J. Phys.* B commissioned topical reviews and tutorials on BEC and a glance at the most recent issues of the journal will confirm the shift away from atomic collisions towards BEC and associated phenomena such as single atomic traps, and
atomic lattices (which we can now see represented in Figure 3). These developments were particularly well represented through the seminal celebratory special issue ‘Atoms, quanta and relativity—a century after Einstein’s miraculous year’, edited by Ted Hänsch, Horst Schmidt-Bocking and Herbert Walther, that appeared in 2005 as part of the World Year of Physics [6].

J. Phys. D has gained in reputation since its inception in 1968. For example, Shuji Nakamura (a Nobel Laureate) reported work on the blue new light emitting diodes in 2008 [7]. Recognising the rapid pace of change in applied physics and the increasingly multidisciplinary nature of the field, the journal provides a good example of how an established title must remain agile to the needs and direction of the community it serves. The recent launch of two new sections on ‘Biological applications of physics’ and ‘Physics of renewable energy and sustainability’ point firmly to how the influencing role physics has to play is now broader than ever.

An interesting development given the current interest in ‘Big Data’ can be found in volumes 33 and 37 of J. Phys. G, published respectively in 2006 and 2010 [8, 9]. These reviews, cited thousands of times each, summarised much of particle physics. Data from previous published papers plus hundreds of new measurements were merged to list and evaluate the measured properties of gauge bosons, leptons, quarks, mesons and baryons. In addition, the current state of play on what the authors call hypothetical particles such as the

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**Figure 1.** The geographical distribution of full-text downloads to content published in the J. Phys. series since 1996. To the end of 2016 articles in the series had been downloaded more than 47 million times from users in over 200 countries.

**Figure 2.** The geographical distribution of authors (based on corresponding author) published in the J. Phys. series since 1996.
Higgs boson (note this dated back to 2006!), heavy neutrinos and super symmetric particles is discussed. The publication of this mammoth compilation has proved to be of great service to the particle physics community.

JPCM has also continued to publish outstanding papers, most recently reflected through the seminal work by David Thouless, Duncan Haldane and Michael Kosterlitz [10–14] that last year led to them being awarded the 2016 Nobel Prize. Continuing its tradition of mirroring the latest developments and direction of condensed matter this year will also see the journal introduce a new subject section structure updated to reflect the most active areas of condensed matter today. Similarly J. Phys. A has over the years successfully adapted its scope and coverage in response to changes in direction of mathematical physics, ensuring that it remains as relevant and vital for that community today as it was 50 years ago.

The future

One major advantage that the J. Phys. series enjoys is that it is part of a much bigger publishing enterprise. This enables the series to use central facilities (such as the design studio, the sales and marketing department, HR, IT and finance). The cost sharing implicit in this arrangement is of direct benefit to the community in terms of prices lower than otherwise would be necessary for a stand-alone series.

Even more significant, however, is the series can learn from other activities within IOPP. Take, for example, the move to Open Access (OA). This is most likely to become of major significance over the next few years. In 1998, IOPP created (in partnership with the German Physical Society) the first fully OA journal covering the whole of physics, the New Journal of Physics. Since 1998, the experience gained from this initiative has allowed IOPP to play a significant part in the debate around OA, and to develop robust, fair and sustainable business models which can be applied generally, including the so-called hybrid model to which the J. Phys. series subscribes.

What else? There will continue to be downward pressure on subscription prices so that IOPP must offer real value for money. There will be developments around the semantic web that will make it easier for readers to navigate through the mass of material relevant to their research. The time between submission and publication will continue to be an important parameter for potential authors as the research landscape becomes evermore competitive, and in response to this demand IOPP recently launched Accepted Manuscripts as a new service that will make articles available with a citable DOI within just 24h of being accepted.

The debate around peer-review and alternative models will also continue and, recognising the important role it has on behalf of the communities it serves, IOPP will again be leading
the way with a novel pilot in 2017 that will explore the demand for ‘double-blind’ peer-review across the broad areas of materials science and the biosciences.

In summary, it has been a delight to review the 50 year history of the J. Phys. series and although it is unlikely that I will be around at the 100th anniversary, I can only wish that the success achieved in the past will continue into the near future.

References

[5] Berry M V 2010 Aptly named Aharonov-Bohm effect has classical analogue, long history Phys. Today 63 8